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ANNUAL INTERIM SCIENTIFIC REPORT.(U)
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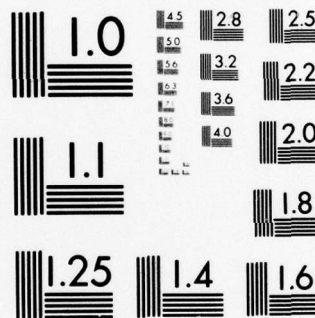UNCLASSIFIED AFOSR-TR-78-1549 NL

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REPORT DOCUMENTATION PAGE

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BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
AFOSR-TR- 78-1549		

4. TITLE (and Subtitle)	5. TYPE OF REPORT & PERIOD COVERED
ANNUAL INTERIM SCIENTIFIC REPORT	Interim
	6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)	8. CONTRACT OR GRANT NUMBER(s)
Richard S. Bucy	AFOSR-76-3100

9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
University of Southern California Department of Aerospace Engineering Los Angeles, California 90007	61102F 2304/A1

11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE
Air Force Office of Scientific Research/NM Bolling AFB, Washington, DC 20332	September 1978
	13. NUMBER OF PAGES
	2

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report)
Rept for 3/ Sep 77 - 29 Sep 78,	UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In the area of finding performance bounds on the nonlinear filtering problem the information rate between the signal at time t and the observation process up to time t has been evaluated for the general discrete time nonlinear filtering problem. This information rate allows a general difinition of steady

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20. Abstract continued.

cont. → state new stronger lower bounds for the filtering error are derived.

In the area of building nonlinear filter the estimate production speed of the two dimensional phase demodulation problem on the Cray 1 is being improved by examining the assembly code generated by the Cray 1 compiler and seeking to improve the running time by changing the Fortran code on the basis of these observations. This latter problem has been extensively investigated on the CDC 7600 and the Star 100, which in fact has lead to increased understanding of some of the architectural design constraints inherent in the use of these machines on problems requiring large memories (i.e. over 200K decimal).

AFOSR-TR- 78-1549

ANNUAL INTERIM SCIENTIFIC REPORT

Grant AFOSR 76-3100

September 30, 1977 - September 29, 1978

Richard S. Bucy
Principal Investigator

Personnel Supported

During the year the following people were supported: Technical
Typist, Ilse Allott; Graduate Students, Faramarz Ghovanlou and Thomas
Bleakney; Secretaries, Virginia Wright and Alice Vaughn; and Principle
Investigator R. S. Bucy.

Research Summary

In the area of finding performance bounds on the nonlinear filtering
problem, we have recently (2) evaluated the information rate between the
signal at time t and the observation process up to time t for the general
discrete time nonlinear filtering problem. This information rate allows
a general definition of steady state (i.e. when it vanishes) for the
general nonlinear filtering problem. Further in steady state new
stronger lower bounds for the filtering error are derived. In the
special case of (1) stronger results are generated.

In the area of building nonlinear filters, we are currently seeking
to improve the estimate production speed of the two dimensional phase
demodulation problem on the Cray 1 by examining the assembly code
generated by the Cray 1 compiler and seeking to improve the running time
by changing the Fortran code on the basis of these observations. We
would like to look at the combined phase amplitude problem on the Cray,
but lack computer time at present.

This latter problem has been extensively investigated on the 7600
and the Star 100, which in fact has lead to increased understanding of
some of the architectural design constraints inherent in the use of these
machines on problems requiring large memory requirements (i.e. over 200
K decimal). These results are reported in (1) and (3).

Papers Appearing

(1) R. S. Bucy, J. Pages "A Priori Bounds for the Cubic Sensor Problem",
IEEE Trans on Automatic Control, Vol. AC-23, 1, 1978, 88-91.
(2) R. S. Bucy "Nonlinear Filtering with Pipeline and Array Processors",
Proceeding Conference on Decision and Control, Dec., 1977, F-9 626-629.

Papers Submitted

(1) R. S. Bucy, K. D. Senne "New Frontiers in Nonlinear Filtering", M.I.T.
Lincoln Lab. Technical Note, 1978-16, 1-54, submitted IEEE Trans on
Automatic Control.
(2) R. S. Bucy "Information and Filtering", submitted Information Sciences.
(3) R. S. Bucy, K. D. Senne "Computational Frontiers in Nonlinear Filtering,
to appear, Proceeding Conference on Decision and Control, San Diego, 1978.